

blenderart

MECH MAYHEM!

Tutorial: Mech Textures

Tutorial: Mech Bust

Tutorial: A Weight Scale

Retracting Landing Gears

The Denier -by Angel Roldan

blenderart

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EDITORIAL



Sandra Gilbert

Manager/Editor

"a large portion of our community thrives on all things mechanical"

I will admit, I am not the most mechanically minded individual and yet, mechanical objects are endlessly fascinating. They can range from the simple can opener to highly specialized robotic equipment.

Like many artists, I have no idea how most mechanical objects work. But a large portion of our community thrives on all things mechanical and spend countless hours faithfully reproducing everything from common everyday items to creating futuristic objects of mechanical ingenuity.

Thinking about it, there is an artistry to a well designed

machine that even the most clueless of us can appreciate. And by clueless, I am of course talking about myself. Honestly I am ecstatic if things work when I turn them on. :P

Which brings us to our fun filled and informative "Mech Mayhem" issue of Blenderart Magazine. We get to take a look at a variety of mechanical projects and the artists who create them.

So find a comfortable spot and get ready to learn all about the rigging, texturing and other mechanical goodies we have gathered up for you.

CONTENTS



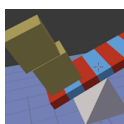
**Tutorial:
Mech Bust**

5



**Tutorial:
Mech
Textures**

9



**A Weight
Scale**

14



**Mechanical
Systems**

17



**Retracting
Landing
Gears**

20

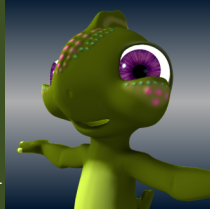


**Creating
Comics
Character**

26

IZZY SPEAKS

the truth and nothing but the truth



Book Review: Death to the Armatures: Constraint-Based Rigging in Blender

I picked this e-book up on a whim and I can honestly say I am glad I did. Most tutorials and books focus on rigging for characters. Which is great, but not everything that moves is a character. And according to Christopher Kuhn, armatures are not the only way to rig an object.

Christopher begins from the viewpoint that armatures are not always the best option and then backs it up with a series of projects that showcase how to use constraints to rig and animate a variety of projects. All of these projects are mechanically based, but as with most things in life could be adapted to a number of different uses.

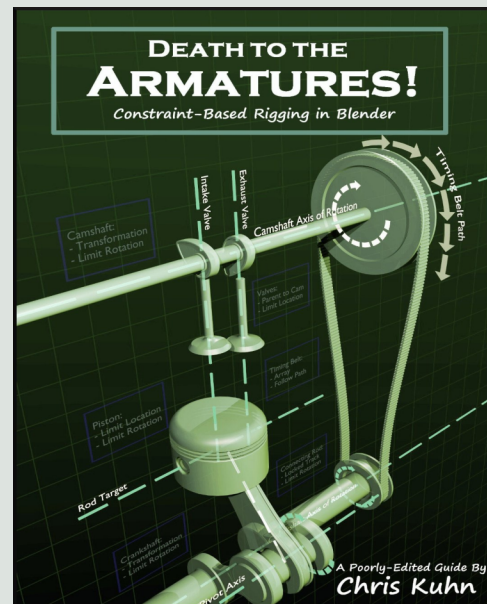
He starts off with a solid explanation of some the constraints used and then builds on those explanations with each project he shows you.

While this e-book is not necessarily geared towards beginners, new users should be able to follow along fairly well as he explains his techniques in a clear and easy to understand manner, making it easy to follow along on each project.

ALSO BY CHRISTOPHER KUHN

Build Your Own Rocket Bike: Sci-Fi Modeling in Blender

An intermediate guide to hard-surface modeling in Blender. The emphasis is on futuristic, science fiction vehicles. The book demonstrates a wide variety of techniques, such as cutting windows into curved surfaces, adding hull panels and lines to smooth models, and building common vehicle components. Related topics such as vehicle design are also covered.



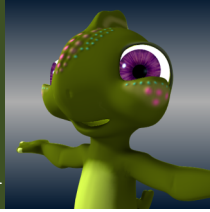
Book Summary from Amazon

"A guide to rigging hard-surface models in Blender without the use of armatures. The book utilizes constraints to achieve realistic motion. Related topics are covered, including Origins, parenting, Empties, Global Space versus Local, etc. Several models are built and rigged in the course of the book, with a single-cylinder gasoline engine as the final project.

This is not a "Blender 101" book. It assumes the reader will have a basic knowledge of modeling (though advanced techniques are certainly not required). All models used in this book can be freely downloaded online."

IZZY SPEAKS

the truth and nothing but the truth



File Size: 6978 KB

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Simultaneous Device Usage: Unlimited

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Sold by: Amazon Digital Services, Inc.

Language: English

ASIN: B00BRNGQVQ

Price: \$4.99

The final project is the "Rocket Bike". By the time the reader gets to this section, they will be able to apply tips and techniques shown throughout the book to create their own version. This is not a "Blender 101" book. It's aimed at people who have a basic grasp of the software and want to learn more complex modeling techniques. The book is exclusively devoted to modeling; there are only passing references to materials, textures, lighting, etc.

If you have a basic understanding of Blender and want to design your own vehicles, this book is for you.

Note: *This book is legible on a Kindle, but the pictures are best viewed on a tablet or PC (in color)* ●

WORKSHOP

Lerning blender bit by bit



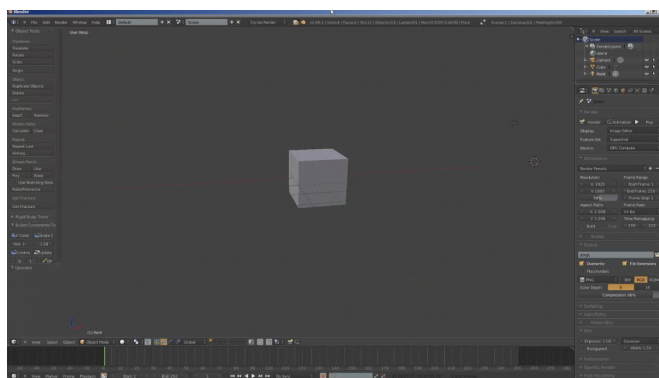
MECH BUST

Jerry Perkins

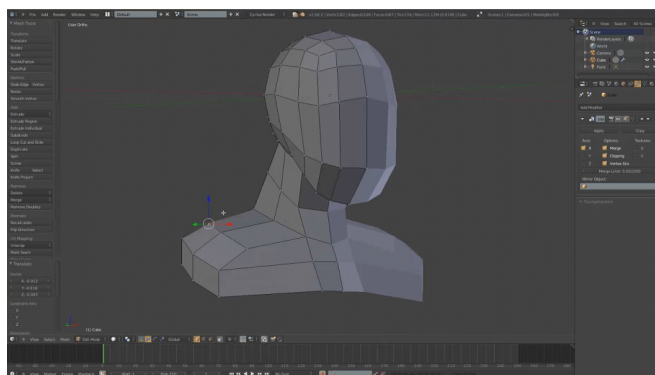
Contributing Author

Hello, my name is Jerry Perkins and online I go by the name masterxeon1001. I have been using Blender for about 3 years now and I would like to go over the workflow for making a mech bust in Blender using 3 of my favorite tools. Dynamic Topology, Retopology and Cycles. So without further ado lets jump in and begin.

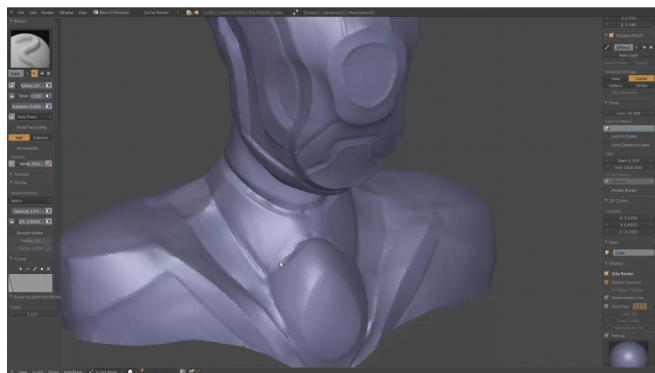
I personally feel cubes are the origin of all matter because of Blender. So let's take the cube into edit mode and w >> subdivide twice and then press shift + alt + s to make it into a sphere. Usually I'll hit 1 so that way it makes it a complete sphere.



After turning on proportional editing I go to town extruding and getting the rough shape of a bust. Revel in the simplified geometry because the better you lay



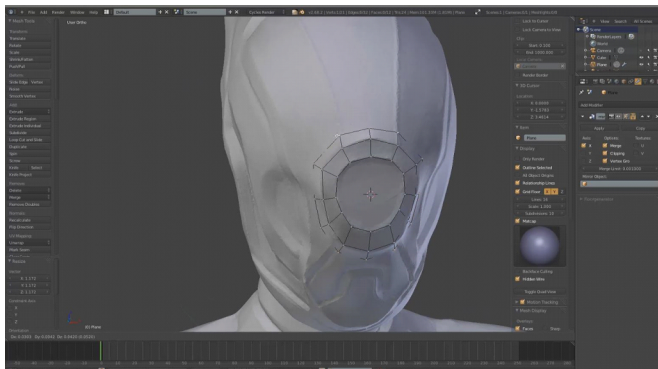
it out here the easier time you will have in sculpt mode.



In sculpt mode I turn on dynamic topology with ctrl + D and also lower the detail size to around 10 to allow me to sculpt up detailed forms. I am merely using standard, clay tubes and polish to get the mesh looking the way I want. A good way to approach it is to raise the edges or dig in with the standard then go back with the polish and make the edging smooth. It's

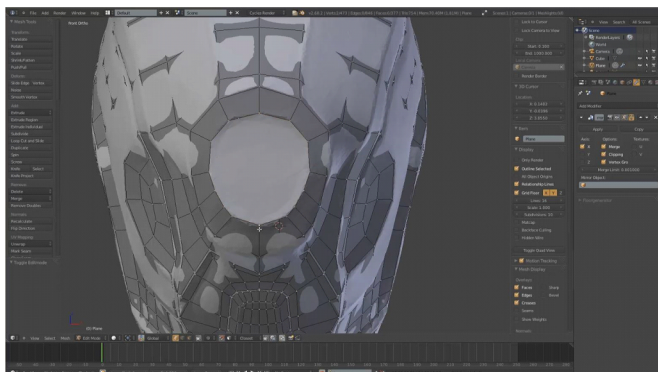


Mech Bust

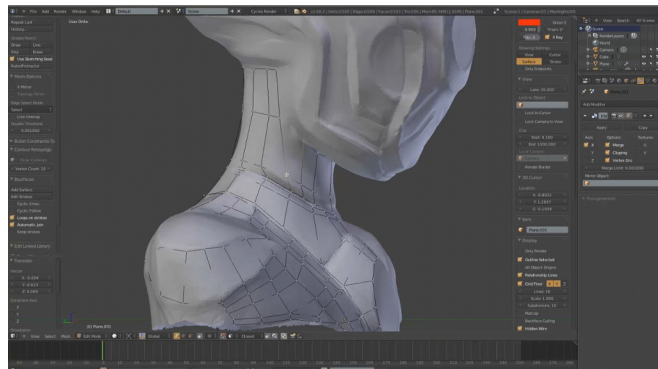


also good to zoom in and out to go between macro and micro detail.

After I get the form that I want to capitalize on, I'll add a plane as well as turn on the magnet for snapping for face and project individual elements. From here it is a game of retopology. If you aren't familiar with snapping and retopology it's something magical where you can take unusable geometry and rebuild your wires around the form for simplification. So during this step you want to keep in mind which pieces are segmented as well as keep a nice edge flow so you can add loops to the edges to give it a hard surface look.

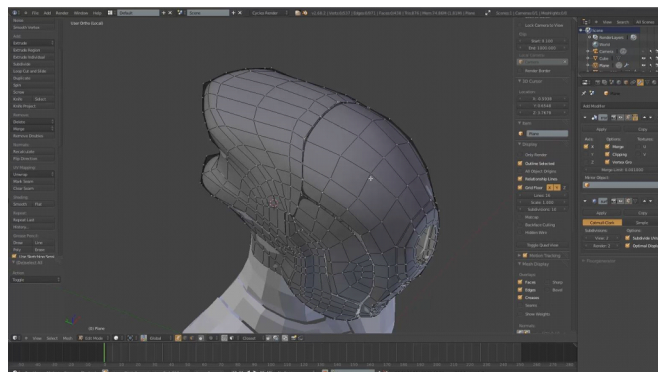


It's also good to use the hidden wire option in the N panel to make the wires only show up on the solid. I usually turn on some tunes and just cover the underlying sculpt. You can also use B-surfaces or Contours for extra speed, however B-surfaces work best here. Keep in mind that the geometry is broken up into pieces so that it's not a solid object. This will help the material and mechanization process.



So now I am finishing up the retopology and am now preparing to solidify the pieces using the solidify operator. Ctrl + F >> solidify. You can also control the thickness in the T-Panel. I hide the loop surrounding it so I can isolate and delete the interior faces. You don't want useless faces that won't be seen by the camera.

When you first add a subdivision modifier with Ctrl + 1. You see the surface looks smooth. So you want to add some edge loops to get hardness at the edge of each segment because otherwise loops too close together don't solidify the best. I usually do that after solidifying each piece individually with L (with the mouse cursor over the part). Personally I select the

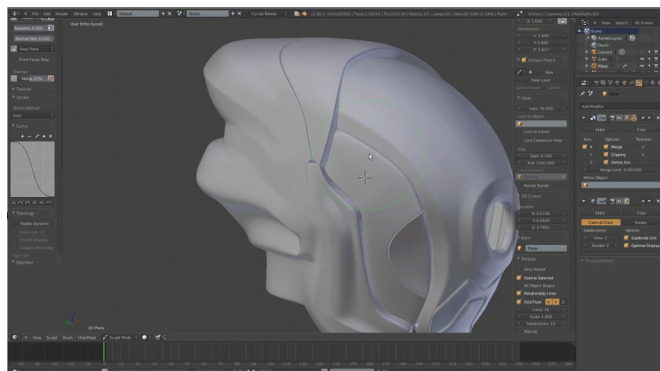


piece with L and then press shift + H to hide other than selected then unhide with alt+h after I finish that segment.

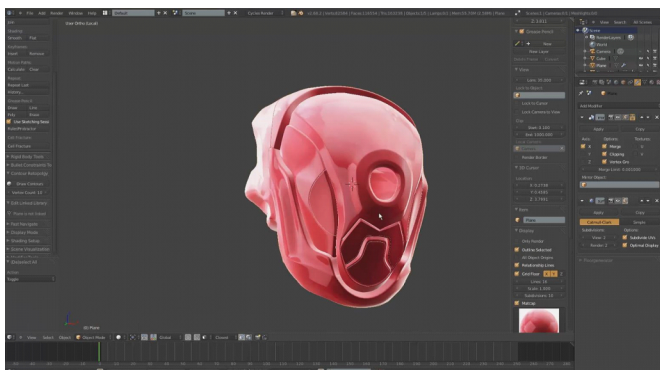
As you can see here I also use the power of sculpt to ensure there are no gaps. At this stage you only want to use the grab brush in small stints to move the pieces into position. I think it's the sub-division that



Mech Bust



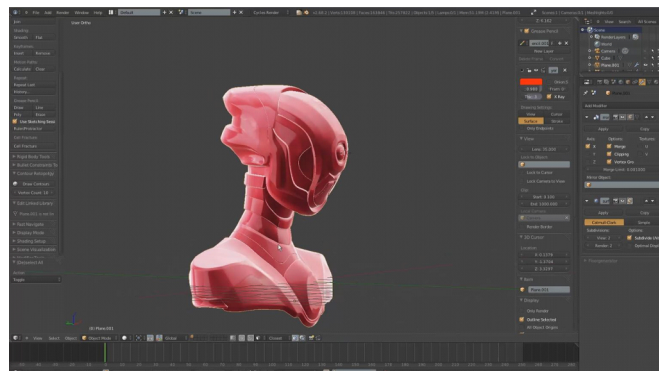
causes the shrinkage but you can hide the parts you are not using while in edit more, then when you got to sculpt mode only the unhidden piece will move. I am so glad I came across that feature because it made mechanizing that much easier.



I enjoy using matcap mode for checking the surface smoothness. That's something I think Claas Kuhnien opened my eyes to with his car experiments but I cannot get enough of the matcap panel under the N-Panel. They allow you to see in real-time how smooth the surface is. My goal is to make it smooth on the surface and hard on the edges. I do this with edge loops but you can also use creasing, however I would recommend against it.

So now I have my finished form. There are some small things here and there I still needed to do. Like fill in holes and whatnot but for the most part it is time to render.

I start off creating a line of 6 planes going up on the z

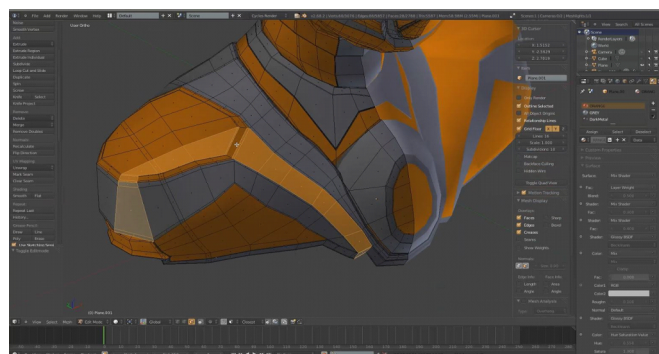


in row for the lighting and reflections and begin moving off to the rendering stage.

So here you can see my lighting setup. That's it and I used HDRI for the rest of the lighting setup. With



lights like this you may also want to uncheck camera in ray visibility so the lights don't show up in the render. Now for the exciting part. Using my edge flow to slap materials on the edges and faces of my object

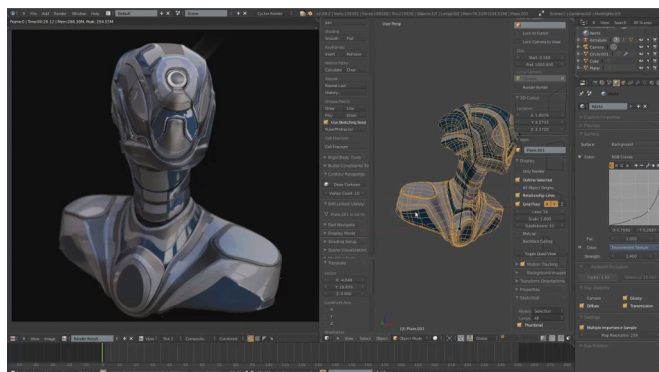




Mech Bust

to get a unique look.

The materials that I am using come from a paint pack that I found on Blendswap for car paint. They are very good.



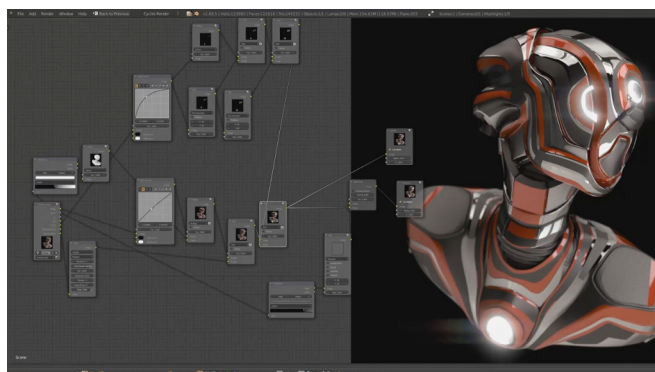
<http://www.blendswap.com/blends/view/47497>

<http://www.blendswap.com/blends/view/69793>

By using these I am able to reduce the amount of work I would normally use for fighting nodes and working out materials. The materials is something I am able to easily change out in the material panel until I find something that works well for me. Its something that I enjoy quite a bit because different material setups create all sorts of moods and atmospheres. I continue to refine the materials until the very end. However the sphere in the forehead is something that I am adamant about giving an emissive material. Emissive materials in cycles on robots is a guilty pleasure of mine however I do try to do it sparingly.

So since it's a bust I might as well add a pose level rig since its only 3 bones. I selected each piece with L and added it to the appropriate group. I find mech rigging to be much easier than organic rigging so there isn't a lot to explain there since each piece is either Red(weightedMax) and Blue(weightedMin). I use an HDRI for the rest of the reflections and to help the render pop and since it looked so blown out you can see I used an RGB curve to adjust contrast for richer reflections.

So for the passes I allowed more than I even used but the main ones is the emit pass which is fed into a glare then with the threshold down and then added back over the render which has been color corrected with an RGB Curve node and a color ramped AO pass



multiplied lightly to darken the crevices and shadow areas. The glare really added life to the image and made it look very awesome in my opinion.

In case you would like to hear me discuss this process more in depth ●

<http://youtu.be/hoaPM1C1vAE>

<http://www.blendswap.com/blends/view/70165>

WORKSHOP

Lerning blender bit by bit



MECH TEXTURES

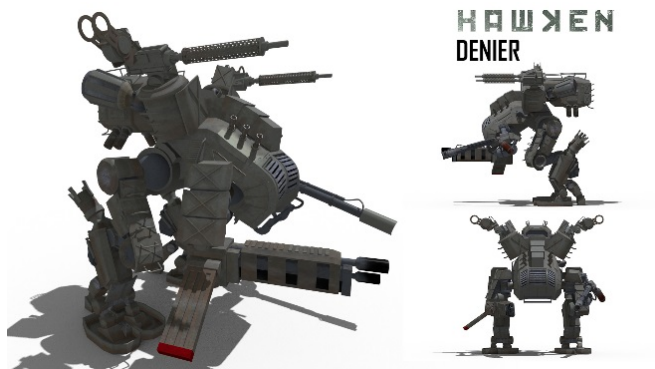
Angel Roldan

Contributing Author

This is the “quick and dirty” on making your Mech look dirty...quickly. When you want your war machine to look like it's been used, nothing gives it that real world look like some rust and old metal textures. In this tutorial, we'll look at some quick ways of applying textures (and adding character) to a completed Mech model.

INSPIRATION

3D Artist Magazine had a competition called ‘Mech Something Awesome’, so the theme was, “asking readers of the mag and fans of free-to-play FPS HAWKEN to create a digital design of a combat Mech using 3D software”.



My original concept was “the Denier”. A Very Long-Range Suppressing Fire Support Mech.

I actually make small thumbnail sketches for different Mech designs all the time. So I grabbed one of my recent sketches and made a model I thought was very “HAWKEN” inspired. Since this is a texturing tutorial, we won't go into any details of what it took to build this beast! Maybe some other time...

TEXTURES

So now that my model was done, I had to decide how to texture this beauty. Again, my concept was going to end up being a dirty, already used, kind of Mech. I went to CGTextures.com and started searching for



METALBARE0174_1_M.JPG
BRONZE COPPER0066_6_S.JPG
METALBASE0017_M.JPG

metal textures. Something aged looking and, hopefully, rusted (at least a little). These are the textures I ended up downloading from CGTextures.com.



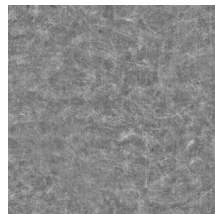
Mech Textures

THE PROCESS OF BODY PARTS

Now it is a matter of setting up a default material with a seamless metal texture mapped to it.

NOTE: While I normally use Blender Cycles I had decided to use Blender Internal Render Engine for this project. **WHY?** Because at the time of this writing, you are not able to **BAKE** your textures using Blender Cycles. You'll see that **Texture Bake** plays an important part in getting these textures done quickly.

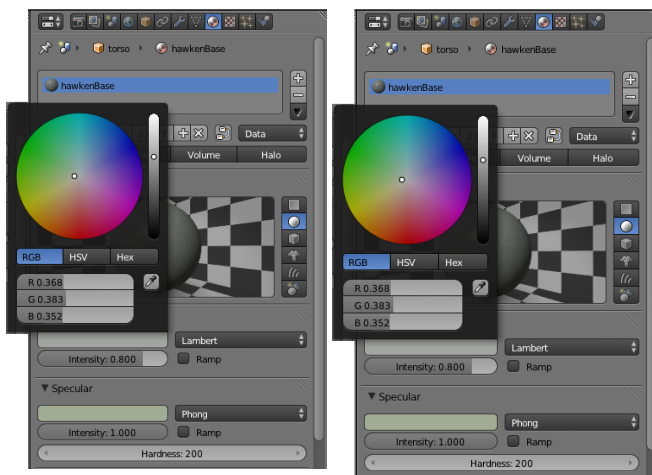
This one uses a seamless metal texture from a deviantART.com user named ~hhh316:



SEAMLESS_METAL_TEXTURE_BY_HHH316-D30X412.JPG

In the MATERIAL panel of Blender, create a material and change the Diffuse color to this:

Now make sure your Specular settings match this next image:



In the TEXTURE panel (Fig. 01), create a new texture and name it something generic. I called mine "seamlessMetal". The texture (A) Type will be Image or Movie and select your (B) Image of the Seamless Metal Texture.

Further down in the TEXTURE panel (Fig. 02), take a look at the (C) Image Mapping section. Make sure

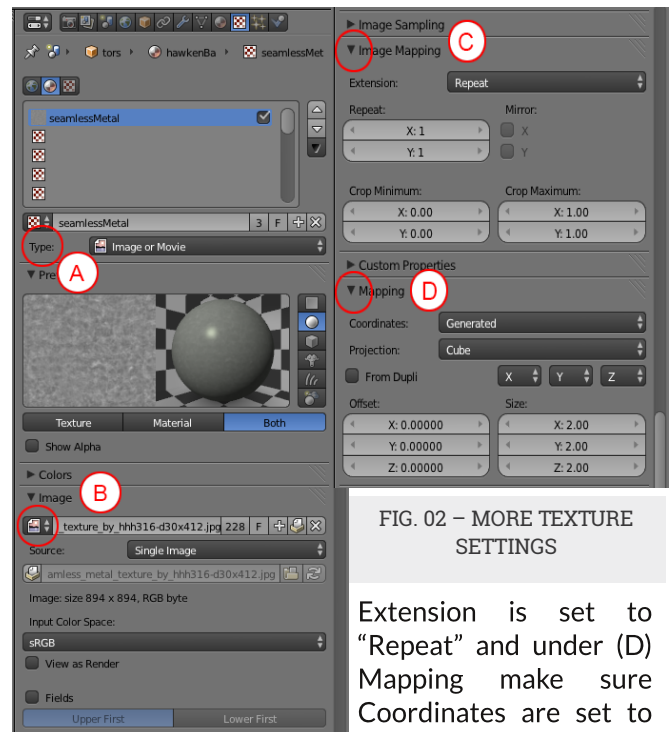


FIG. 01 – TEXTURE SETTINGS

FIG. 02 – MORE TEXTURE SETTINGS

Extension is set to "Repeat" and under (D) Mapping make sure Coordinates are set to "Generated" and Projection is set to "Cube". Now apply this material to every part of the Mech that is going to have a basic green military look to it.

Quick Tip: you can apply this Material to one part (the torso, for example) and then select all the other parts that will match (SHIFT+Right Mouse Click). Then, making sure the object that already has the material is the last one selected (active object) using the shortcut (CTRL+L) you can choose MATERIALS and it will link all your objects to this material.

BAKING (THIS IS IMPORTANT)

Now in order to BAKE each texture, every object has to have its own, unique material. So in the MATERIALS panel select an object (the torso, for example) and Left Mouse Click on the small number located next to the material name (Fig. 03). This will make a unique material assigned to the current



Mech Textures

object. Rename it to something appropriate (Fig. 04).

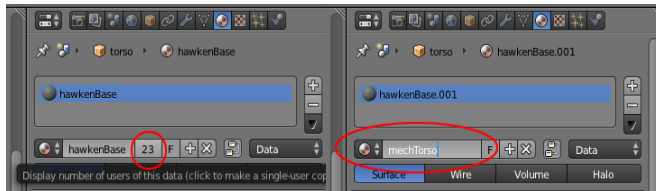


FIG. 03 – MAKE MATERIAL UNIQUE

FIG. 04 – RENAME MATERIAL

The next few steps are easier to do in the UV Editing workspace preset (Fig. 05). Now, in the RENDER panel (Fig. 06), at the very bottom, you will find a section labelled (F) Bake. In there, you will set the options to (G) Textures and make sure (H) Clear is not checked. I set (H) Margin to 2 and leave (H) Split set to “Automatic”.

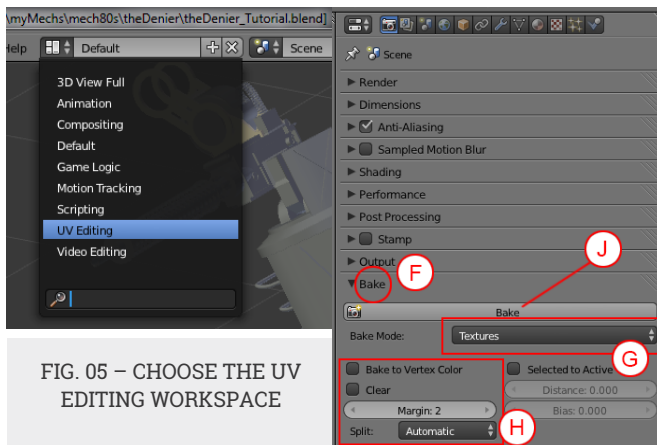


FIG. 05 – CHOOSE THE UV EDITING WORKSPACE

FIG. 06 – BAKE SETTINGS

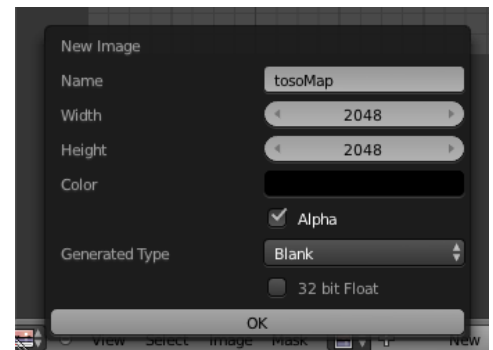
Now you are ready to Bake!

On the left side of the Blender Workspace you should have a UV/Image Editor window open. The right side should be the 3D View. Select your object. Press (TAB key) to go into edit mode. Make sure no faces, vertices or edges are selected then press (A key) to select all your faces. Now press (U key) to bring up the UV Mapping Menu. Select “Smart UV Project”. A new menu will open showing the options for Smart UV Project. Just leave the default settings and click OK.

In the left side window (UV/Image Editor) your

unwrapped UV map will be generated. Left Mouse Click on (Image > New Image). I always set my textures to be 2048 x 2048, but using the default of 1024 x 1024 is fine. I name my texture to something unique (torsoMap in this example).

Left Mouse Click on OK and Blender will generate a new, blank texture.



Now in the RENDER panel, click on Bake (see Fig. 06 – Section J). When Blender is done baking, you'll see a texture in the UV/Image Editor that was generated with your generic base military green on it. Left Mouse Click on (Image > Save as Image) and save this texture.

NOW WE PAINT . . .

Next we are going to add some variety, weathering and age to the Mech metal by painting directly on the textures in Blender. I try to emulate aged machinery. I used lots of images from Google of machinery, military tanks, and Mechs as inspiration.



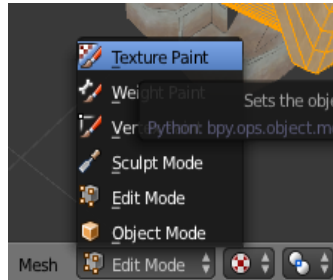
I tend to put the rust towards the edges of the panels. This looks more realistic to me. You can also use scratches and worn paint texture as well, if you like.



Mech Textures

Be creative. Since it is easy to blend the textures in the Texture Paint mode of Blender, you can get great results with some experimentation!

In the 3D View of Blender, set the Object Interaction mode to Texture Paint as shown here:



To paint the textures (Fig. 07) you can adjust the (K) Radius and Strength to get the (L) Brush results you want. I leave the (K) Blend mode on Mix. Also, I set the (M) Overlay to a small Alpha Value (around 20%) so it is easy for me to see the model through the texture I'm using. Notice that the (N) Brush Mapping is set to Stencil. This will enable a texture overlay that you will use to paint with in the 3D View.

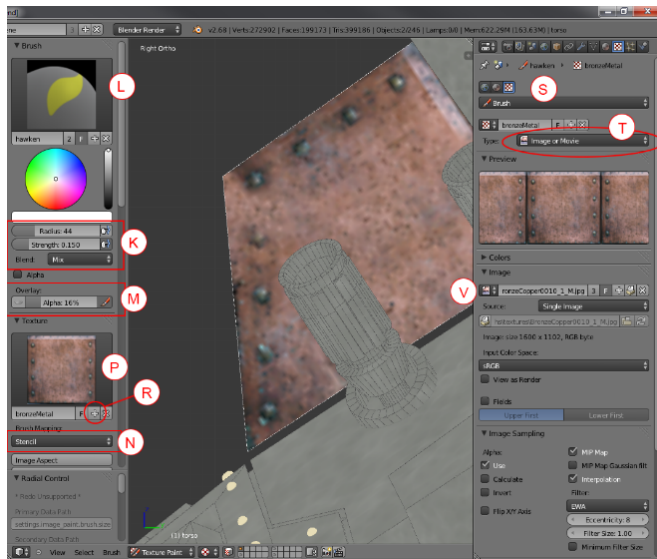


FIG. 07 – PAINTING THE TEXTURES

You can add Brushes as needed but I normally use the default brush and add (P) Textures that I can switch back and forth between. To add a new texture, first you click the (R) PLUS symbol. This will add a new texture channel, but you still need to select an image. This needs to be done in

the (S) Brush settings over in the TEXTURE panel. Change the (T) Type to Image or Movie, select an (V) image to use (or OPEN a new one), and it will be available in the (P) Texture section of the brush setting. Left Mouse Click directly on the (P) Texture to select which one to use. If you do not see the brush settings in the 3D View, the (T key) will toggle it opened or closed

You can move the Stencil texture around in the 3D View by (Right Mouse Click + Drag) to move it around, (Shift+Right Mouse Click) to Scale it, and

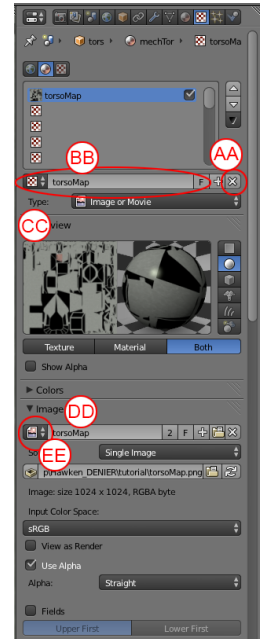


FIG. 08 – MAPPING THE PAINTED TEXTURE

(CTRL+Right Mouse Click) to Rotate it. After you are done painting the texture, be sure to save the texture in the UV/Image Editor by Left Mouse Clicking on (Image > Save Image). This will overwrite the texture you created with the freshly painted texture you have been working on.

BACK TO MAPPING

Now you will need to map this new texture you created to the unique Material you made for this part (Fig. 08). Go into the TEXTURE panel. The material you made unique should still have your Seamless Metal Texture linked to it. (AA) Unlink that texture by clicking on the X next to the Browser.



FIG. 09 – UV MAPPING THE PAINTED TEXTURE



Mech Textures

Now click on the button labelled “NEW” (NOT SHOWN HERE) to make a new (BB) Texture channel (I named mine “torsoMap”). Set the texture (CC) Type to Image or Movie. In the (DD) Image section, select the painted image you have saved in the (EE) Browser drop down.

Finally (Fig. 09), in the (FF) Image Mapping section of the TEXTURE Panel, set the Extension to Clip. In the (GG) Mapping section, set the Coordinates to UV and the Projection to Flat.

Your painted texture should now be mapped to your model and ready to render!

IN CONCLUSION

You can get very good results very quickly by using this process. Just repeat the steps for each part of the Mech. The main points of the process are:

- ◆ Make a generic, military * green base material to apply to the model.
- ◆ Make a unique material for each object (torso, arms, legs, boosters, etc...).
- ◆ Unwrap that part.
Bake the texture for that part.
- ◆ Paint on that texture.
- ◆ UV Map your painted texture to your unique material.



Be sure to save your textures when you are done painting on them. If you forget and you close Blender, all the painting you’ve done will NOT be automatically saved. You will lose any unsaved texture painting ●

LINKS

Blender 3D:

<http://www.blender.org/>

CG Textures:

<http://cgtextures.com/>

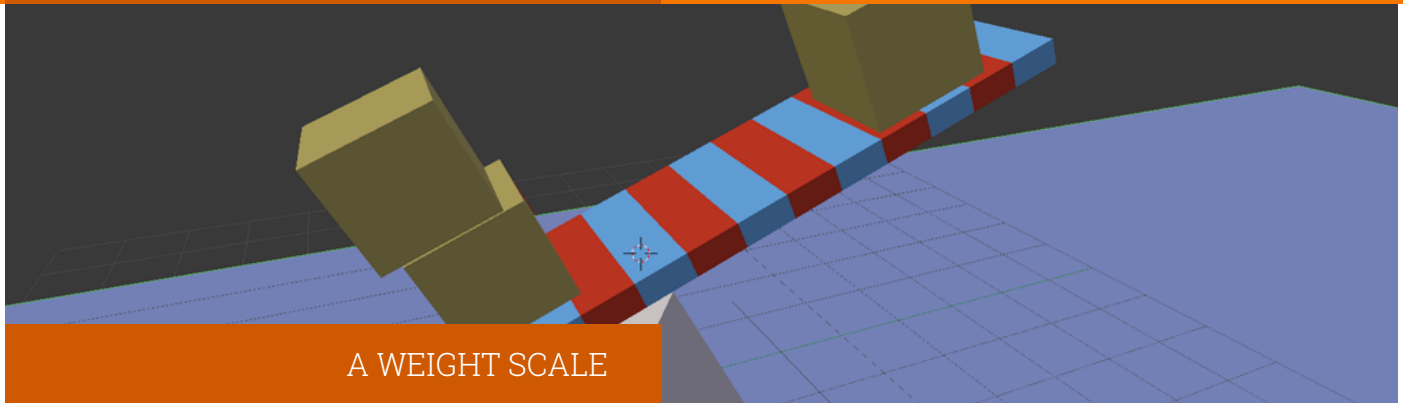
3D Artist Competition Results:

<http://www.3dartistonline.com/news/2013/09/mech-something-awesome-the-winners/>



WORKSHOP

Lerning blender bit by bit



Hakkı Rıza KÜÇÜK

Contributing Author

Today, I will show a very easy scene about scales, with real physical settings. You can check this article to teach your students with real-time experiments or just for fun!

(I am using BL2.68a)

So, for starting, add a plane, scale up how you want and then extrude down ("TAB" to jump edit mode and "E" to extrude) a little bit. Or you can just add a cube and change the size of it. This will be our ground for the scene and it must be like a box, not a 2D plane. To avoid physical fails, you need to use 3D objects.

And MAKE SURE THE ORIGIN OF THE OBJECT IS AT THE MASS CENTER OF THE OBJECT. To make sure press "SHIFT+CTRL+ALT+C" and click "origin to the center of mass". This may not be so important for passive objects, but it is for active objects.

Anyway, after that add a cube and move it over the ground that we just created. The current scene will look like this PICTURE 1.

NOW OUR STEPS BEGIN...

Step 1- Go to edit mode and choose one of the edges of the cube (of course, the edge of the upper face).

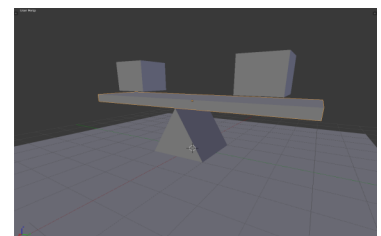
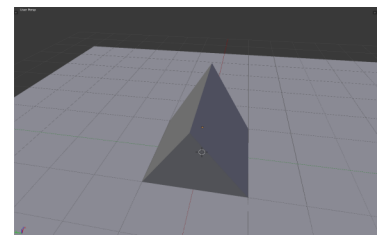
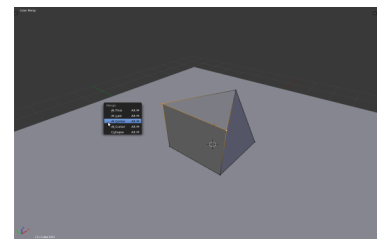
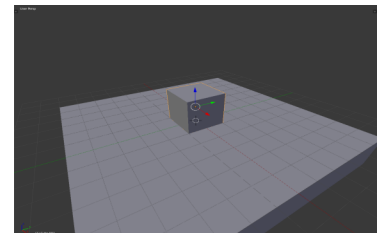
Then press ALT+M and click "at center" as you can see in PICTURE 2.

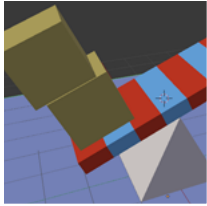
In final, you will get a result of triangular prism. PICTURE 3

Step 2- add another cube and resize it like a rectangular prism. Then put it over the triangular prism. Now our scaler is ready!

Step 3- create two more cubes and put them over the rectangular prism. Not so important, but if you can place them symmetrically, you get better results. Your result may look like this PICTURE 4.

Step 4- Now we can set up the physical settings. Press A to select everything. If it doesn't press again. Then press CTRL+G to group all of them. This group will be our

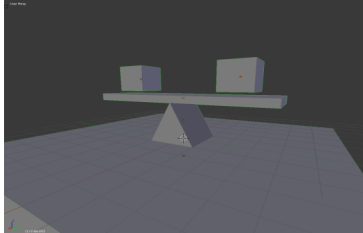




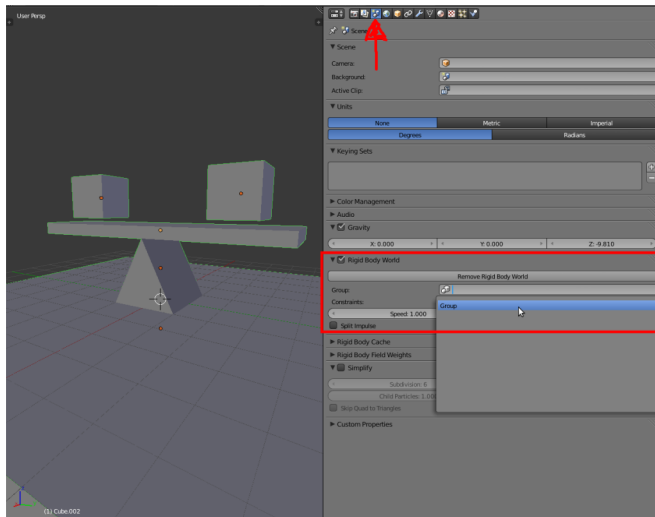
A Weight Scale

physical objects group. PICTURE 5.

Step 5- Now in the right side window, jump to scene menu and find Rigid Body World. Click Add Rigid Body World and for group, choose our group that we just created. If you did not rename the group, it will appear as “group” PICTURE 6.



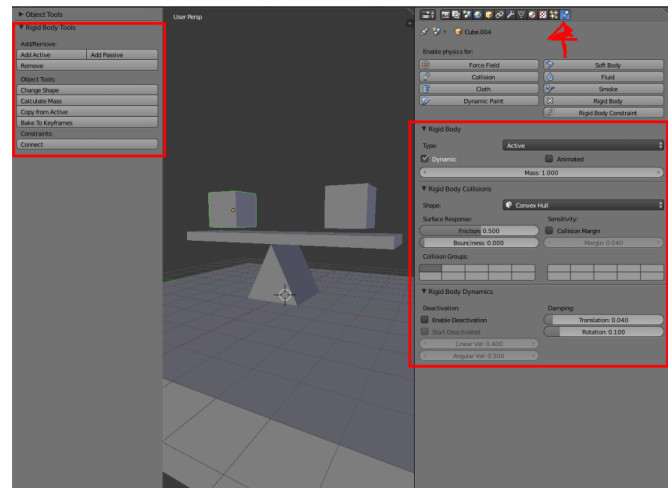
Step 6- So, in the scene, some of the objects will move freely, and some of them will not. That will be as PASSIVE and ACTIVE objects in blender. To do that, Press T and in the left toolbar menu, find rigid body tools. You will see “add as active” and “add as passive” options. That means “add the object to physical world as passive or active”.



The ground object and the triangular prism will be passive objects. Add them as passive. And all the other three objects will be active. PICTURE 7

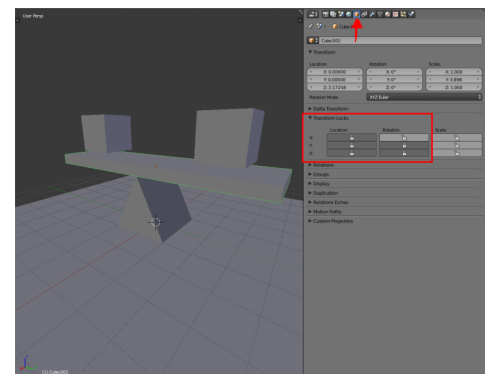
By pressing ALT+A you can see that you got a result already! But the animation is a little bit creepy. Now we will fix that.

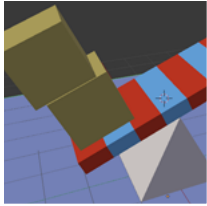
Step 7- Select rectangular prism and at the right window, go to the “Object” menu and find “transform locks”. Transform lock will allow you block the motion of the object. For example, by locking all the location axes your object will not move to any of these axes. We don't want our rectangular prism to move, it must only rotate, which depends on the mass of objects. So lock all the location axes, and two rotation axes to avoid rotating like ball. Your finished result will look like this PICTURE 8.



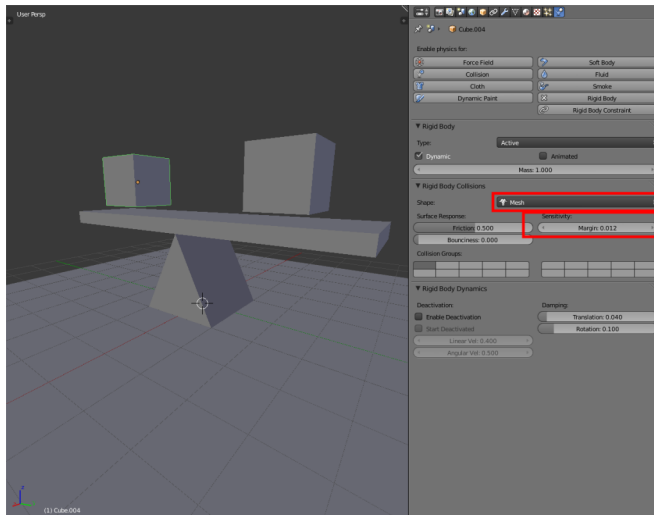
We are almost done. Actually, if you did not get an error yet, you're done :) . But for best result, we need to change some more settings in “physical settings”.

Step 8- In physical settings, make all objects as “mesh”. If you notice when you play the animation the objects are not touching each other at all, make all the margins about 0.012. PICTURE 9

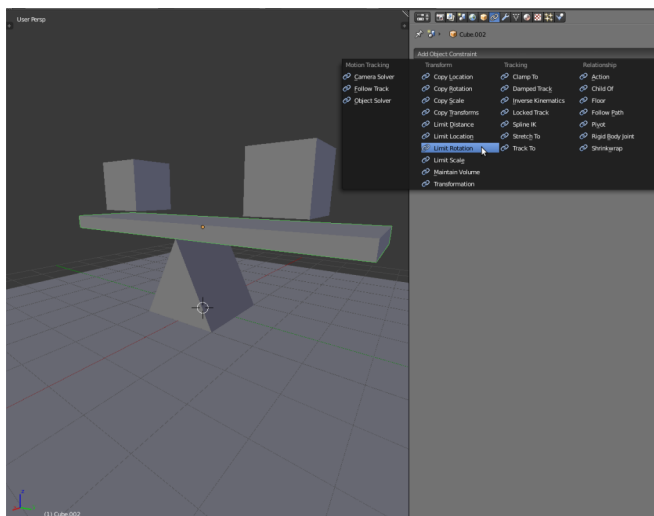




A Weight Scale



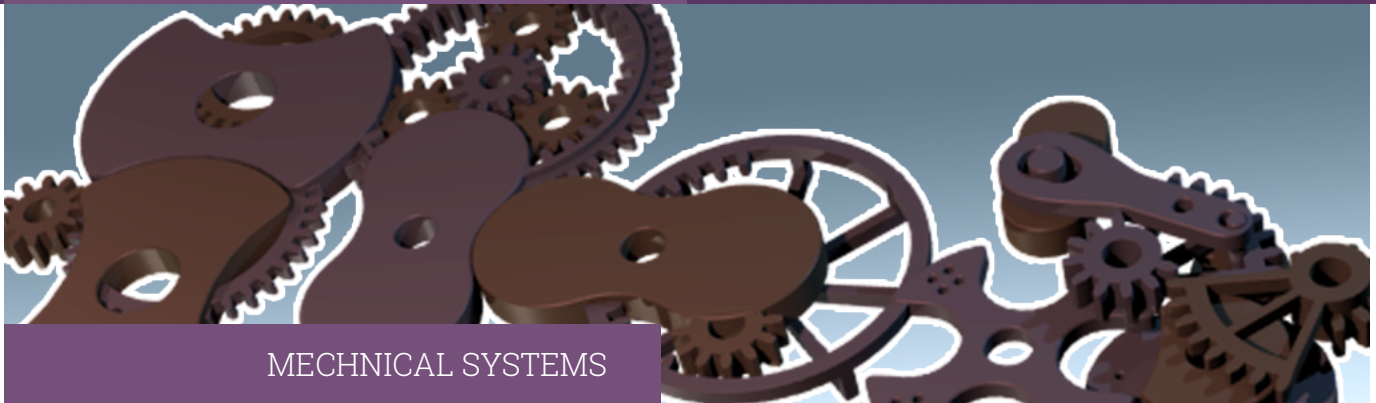
Step 9- If you notice that the scaler is rotating all the way around, you can use “limit rotation” under “constraints” menu. PICTURE 10



So buddies, congrats! We finished it, you can try various stuff like moving the scaler to create degrees or in the rigid body tools menu you can choose countless type of masses and see the animation result! ●

MAKING OF

Exploring blenderart and blenderheads



MECHANICAL SYSTEMS

Alain Mathez (mcBlyvers)

Contributing Author

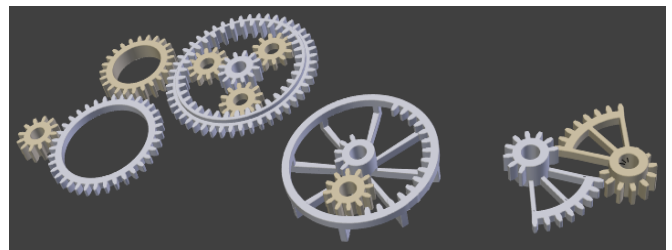
My First article in the Blender Art Magazine was the "Caterpillar Soft Track" in the Issue 19. Be quiet, this time I am not going to write a 22 page article on mechanical systems. In fact, I am not going to write an article at all. Instead, I will give you some of my mechanical "rigs", and some descriptions. The method is always the same, I drive everything with a single Empty which name is E-Master.

Difficulty-level: medium (only the principles are briefly described below)

If I have to move a piece, I drive the Delta Location instead of the Location. This allows me to change the position of the piece and keep the movement intact.

I often use Empties as Parents, for the same reason. I can slightly change the rotation of a gear, to avoid the teeth touching another gear, and keep the "driven d" rotation as desired. But I could use Armature and Bones as well.

Let's go. Empties are on Layers 1, 2, 3, 4, 5 and 6, Gears and other objects are on Layers 11, 12, 13, 14, 15 and 16. Move the Empty E_Master or play the animation to see how everything is synchronized.



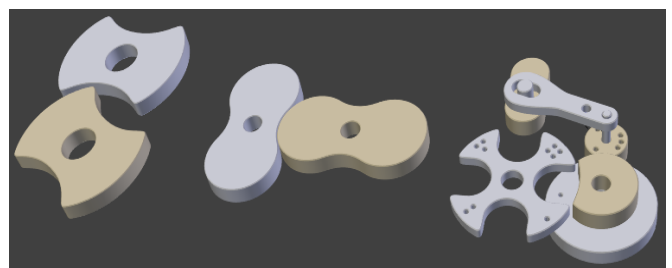
On Layer 11 :

- ◆ E_Drived_A, B Use an Expanded Polynomial Driver (driven by E_Master) on Z Rotation axis
- ◆ E_Transformed_A Uses a Transform Constraint with E_Master as Target
- ◆ E_SatellitCenter Uses an Expanded Polynomial Driver (driven by E_Master) on Z Rotation axis
- ◆ E_Satellit_A, B, C Are Children from E_SatellitCenter

Use a Copy Rotation Constraint with E_SatellitCenter as Target

- ◆ E_GearReverse_A, B Use a Keyed Driver (driven by E_Master) on Z Rotation axis
- ◆ E_2Speed_A, B Use a Keyed Driver (driven by E_Master) on Z Rotation axis

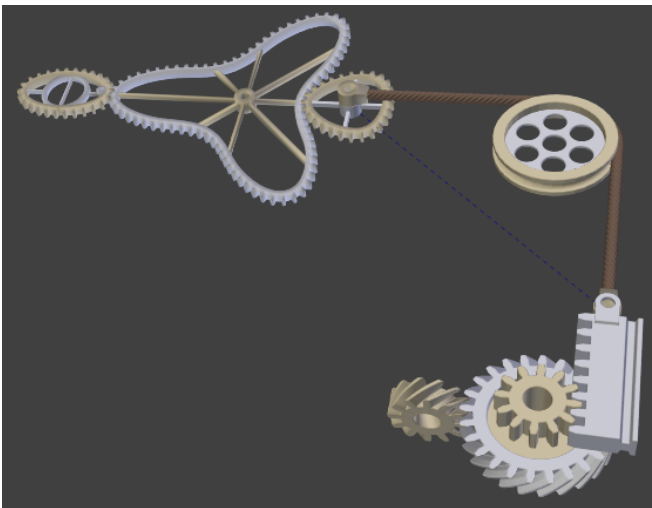
On Layer 12 :





Mechanical Systems

- ◆ E_Hatchet_A, B Use a Sine Driver (driven by E_Master) on Z Rotation axis
- ◆ E_Potatoe_A Uses an Expanded Polynomial Driver (driven by E_Master) on Z Rotation axis
- ◆ E_Potatoe_B Uses a Keyed Driver (driven by E_Master) on Z Rotation axis
- ◆ E_4Steps_A, B, C Uses a Keyed Driver (driven by E_Master) on Z Rotation axis

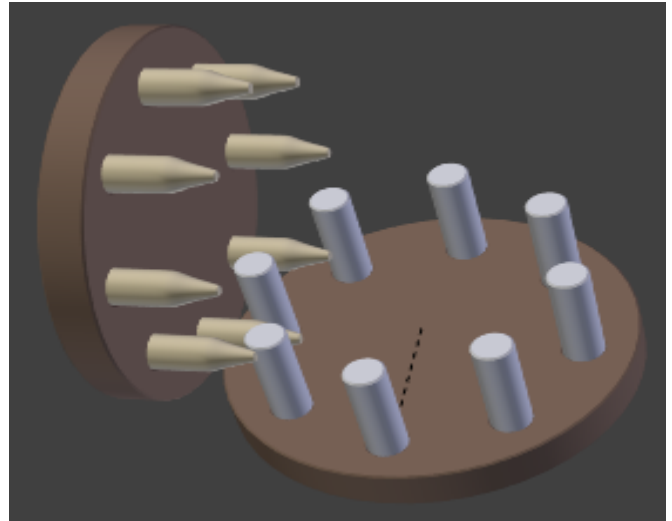


On Layer 13 :

- ◆ E_EllipseTri_A an Expanded Polynomial Driver (driven by E_Master) on Z Rotation axis
- ◆ E_EllipseTri_B, C Use a Keyed Driver (driven by E_Master) on Z Rotation axis
- ◆ E_EllipseTri_C Uses a Keyed Driver (driven by E_Master) on Z Rotation axis
- ◆ E_RopeWheel Uses a Transform Constraint with E_EllipseTri_C as Target
- ◆ E_Rope Uses a Transform Constraint with E_EllipseTri_C as Target

This Transform Constraint is used to add a Scale Factor on the movement of the Target. It's like using a Copy Location Constraint with an Influence greater than 1. Without this trick, the rope would slide slightly, because of the Curve Modifier. Is it really normal ? I don't know.

- ◆ E_GearRack_A Uses a Transform Constraint with E_EllipseTri_C as Target
- ◆ E_GearRackTwist_B Uses a Transform Constraint with E_EllipseTri_C as Target



On Layer 14 :

- ◆ E_CopyMaster Uses a Copy Location Constraint with E_Master as Target
- ◆ E_SlowParent Is a Child of E_CopyMaster, with Slow Parent
- ◆ Uses a Limit Distance Constraint with E_CopyMaster as Target

With Slow Parent Offset = 1000 and Limit Distance = 0.095, E_SlowParent is able to follow E_CopyParent (and E_Master) with a delay. This is useful to simulate the space between the teeth of the wheels. When the rotation of the motor is reversed, in reality the following gear will not react instantaneously. The space between the teeth have first to be counterbalanced.





Mechanical Systems

On Layer 15 (correct effect is only available from Frame 1 to Frame 250) :

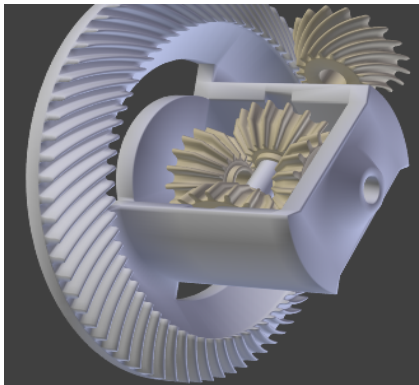
The supposed motor is E_OneWay_Crank_A or B. It rotates about 360 degrees and reverses automatically. The final piece E_OneWay_Rotation will always rotate clockwise. This can simulate a street organ with a crank that the player can turn clockwise or anti-clockwise and the music paper will always go in the right direction.

- ◆ E_OneWay_Parent_A, B Use a Keyed Driver (driven by E_Master) on Z Rotation axis
- ◆ E_OneWay_Rotation Uses a Keyed Driver (driven by E_Master) on Z Rotation axis
- ◆ E_OneWay_Crank_A, B Use a Keyed Driver (driven by E_Master) on Z Rotation axis

The rest is difficult to describe, but you will easily see the goal of each Empty when you activate the Layer 15 and animate the Empty E_Master.

On Layer 16 :

This differential is using principles which are already described in Layer 11. In fact, this is a first version of a bigger system, which includes a brake. But it is still a "Work In Progress" on my Computer.



Because of that, I won't go deeper in detailed explanations here.

In the second file :

I realized this system some years ago, with Blender 2.48 or 2.49. And guess what, it's still working! If you launch the animation, the Empty Motor will rotate. You can move the Empty E-MainTarget in the up right window and see what's happened. In fact, the system

is based on reality, with LockTrack Constraints on Empties.

The LockTrack Constraint is not as famous as the TrackTo Constraint. But in most cases for mechanical systems,

LockedTrack is better than TrackTo, because LockedTrack works like a hinge, and TrackTo works like a ball joint (a sphere). Some of the names in the Blend file are in French, so don't be surprised if you see one.

In fact, all those examples are the basis of a "Mechanical Library" that I have been preparing for a few months. My goal is to publish a large collection of mechanical systems, with Drivers and Constraints, and of course some short tutorials or detailed explanations for every case.

If you have ideas or suggestions, feel free to send them to me at info@mcblyver.ch

For now, I hope my very first examples will be helpful in some cases ●



MAKING OF

Exploring blenderart and blenderheads



RETRACTING LANDING GEARS

Witold Jaworski

Contributing Author

Most of the fast airplanes have retractable landing gear. You must extend it in the ground scenes and retract in the pictures of the flying airplane. Of course, it is possible to move and rotate each of the landing gear parts separately. However, I assure you that such an exercise will become very tedious when you repeat it several times. The better idea is to use the rich set of Blender animation tools. In this article, I will show you my solution for controlling the movable parts of an aircraft model.

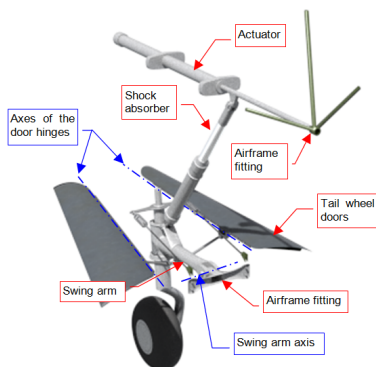


FIGURE 1 ELEMENTS OF THE P-40 TAIL WHEEL ASSEMBLY

I will explain this using the example of a tail wheel assembly (from the model in the picture above). Let's take a look at this mechanism (Figure 1). The wheel is pivoted on the fork, which is attached at the end of the swing arm. There is also a shock absorber and an actuator, which, when moved, pulls forward the shock absorber, rotating the swing arm and retracting the tail wheel.

We can easily recreate the base mechanism using an armature. It will consist of 3 bones (Figure 2):

Unfortunately, when the modeled elements have to perform spatial movements, the bones have tendency to rotate around their longitudinal axes.

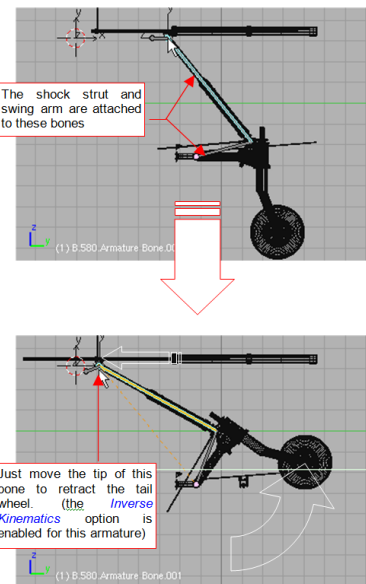


FIGURE 2 BASIC TAIL WHEEL MECHANISM, CREATED WITH AN ARMATURE.

This can lead to surprising results. For example, I tried to use similar "three-bone" setup for the tail wheel doors retraction mechanism (Figure 3):

You still could master such an "unruly" armature, but, frankly, I did not want to spend much time on such trials. During my attempts to cope with the bone torsions I learned more about object constraints. Then I quickly came to the conclusion that it is possible to extend and retract the landing gear without any bones through a single shift of an auxiliary handle. You just need to reverse the cause



Retracting Landing Gears

and effect sequence. The swing arm will not be dragged by the shock absorber, just the absorber will move, because it will be pushed by the rotating swing arm. When you do it right, the external observer will not notice the real relationships between various parts of this

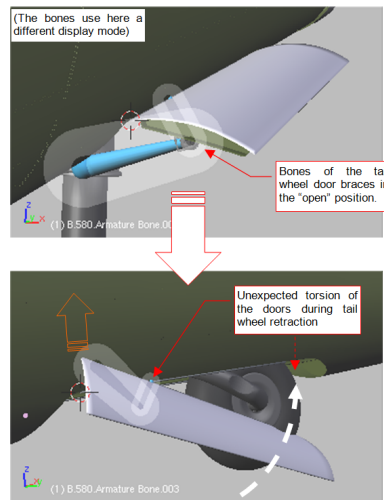


FIGURE 3 PROBLEMS WITH THE DOORS INTERMEDIATE POSITIONS

mechanism. Using such a solution you can model the entire assembly using a few constraints. The armatures with their Pose Mode are no longer needed.

I started by creating an auxiliary handle object, named X.500.Handle (on a layer which is not rendered). Then I used a Locked Track constraint to direct the swing arm toward this handle (Figure 4):

In such a setup like in Figure 4, when I move the handle upward, the tail wheel retracts. To extend it, I have to move the handle downward. In general, you can use the Locked Track constraints to create “pivot joints” in your mechanisms. So far,

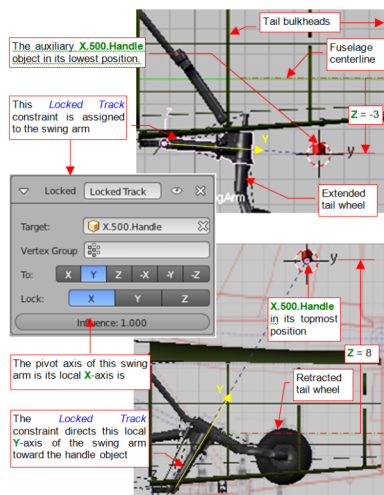


FIGURE 4 USING A LOCKED TRACK CONSTRAINT TO RETRACT THE TAIL WHEEL

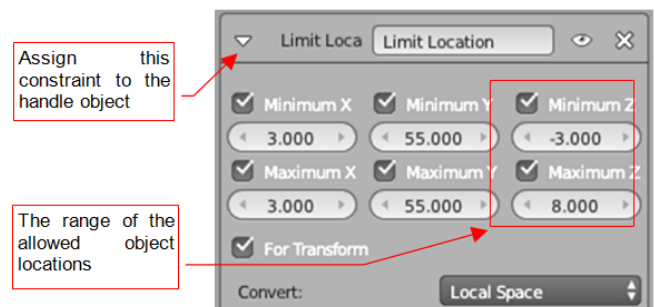


FIGURE 5 RESTRICTIONS IMPOSED ON HANDLE LOCATION

it is nothing extraordinary, is it?

Let's start to enhance this simple scheme. For example, you can use a Limit Location constraint to restrict the handle movement to a “reasonable” range (i.e. a range that corresponds to realistic positions of the controlled mechanism). Figure 5 shows such a restriction imposed on the handle from Figure 4:

In this way, you do not have to worry whether you have set the handle in the appropriate location because it is forced by the constraint.

To include this shock absorber and the actuator into the virtual mechanism, you have to choose carefully the origins of these objects (Figure 6):

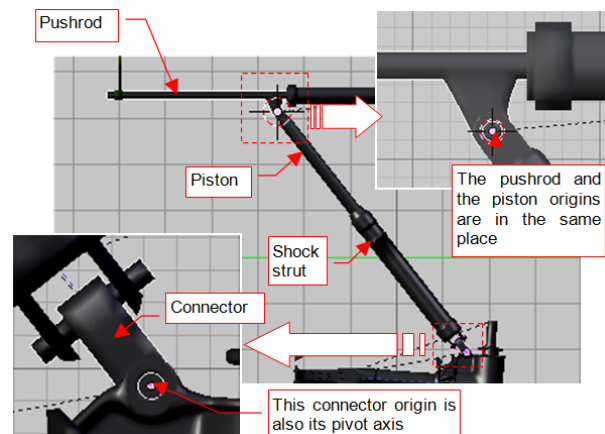


FIGURE 6 ORIGINS OF THE TAIL WHEEL ASSEMBLY ELEMENTS



Retracting Landing Gears

In the mechanism like this, the actuator pushrod and the shock absorber piston should have their origins in the same place. The logical hierarchy (the Parent relationships) of these objects is also important. Assign the piston to the pushrod, the shock strut to the connector object, and the connector to the swing arm (see Figure 6).

Use another Locked Track constraint to direct the connector (and its “child” – the shock strut) objects toward the pushrod origin (Figure 7):

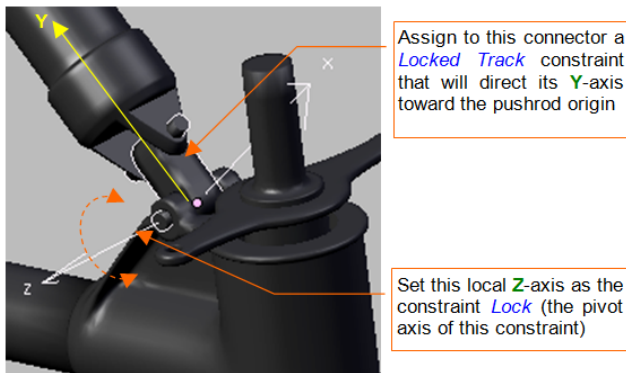


FIGURE 7 CONSTRAINING THE CONNECTOR OBJECT

Assign two other Locked Track constraints to both shock absorber parts, to direct their Z-axes toward the parent of the opposite element (Figure 8):

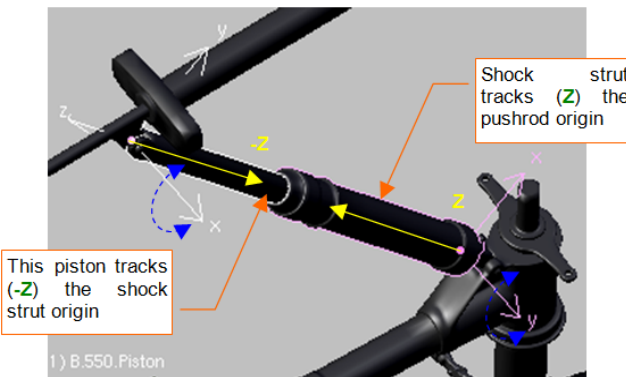


FIGURE 8 CONSTRAINING THE SHOCK ABSORBERS PARTS

Such a constrained shock absorber deflects and extends, following movements of the handle. However, we still have to force the actuator pushrod to perform the linear movement. But how can we obtain such an effect?

For the actuator pushrod, we will use an “all-purpose gear”: the Transformation constraint (Figure 9):

In the result, a single handle movement drives the tail wheel mechanism (Figure 10):

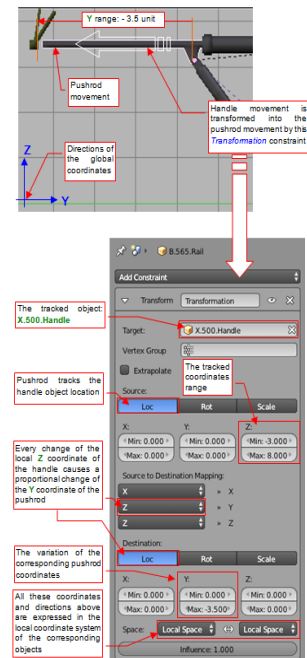


FIGURE 10 TAIL WHEEL RETRACTION

Of course, if you want to create an animation sequence, you can assign to this handle object a movement curve (F-Curve). It is simpler than dealing with the armature bones!

There is still one detail missing: the shock absorber deflection that occurs under various loads (the static weight of the airplane standing on the ground, or the dynamic forces during landing). To reproduce this effect, I use the “child” handle (Figure 11):

I shaped this child object as a “donut” around the original handle – just to grab it easily, when needed. Initially its origin is

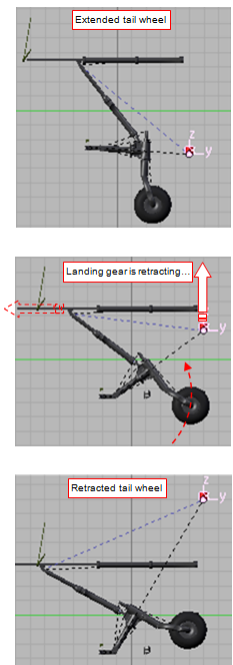


FIGURE 11 THE “CHILD” HANDLE, TO CONTROL THE LANDING GEAR DEFLECTIONS IN THE “LOADED” POSITION



Retracting Landing Gears

in the same place as the origin of its parent — the main handle object (X.500.Handle). This child handle has a Limit Location constraint, which allows it to move within the range of 2 Blender units from its parent. (Note that you still have to enter the corresponding Maximum and Minimum values as you can see them in the Object properties panel — see Figure 11).

When the child handle is set, use it in the Locked Track constraints of the swing arm and the shock absorber objects (Figure 12):

To close and open the tail wheel doors, assign to their hinges Transformation constraints,

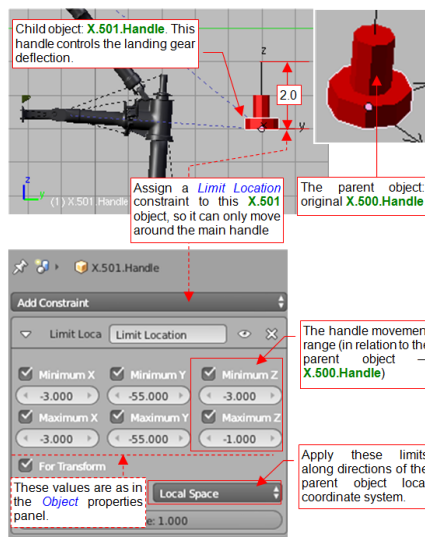


FIGURE 12 THE EFFECT OF LANDING GEAR DEFLECTION

which convert handle location into rotations (Figure 13):

The last element we have to animate is the door retraction mechanism (Figure 14):

It consists of a central pivot, which connects

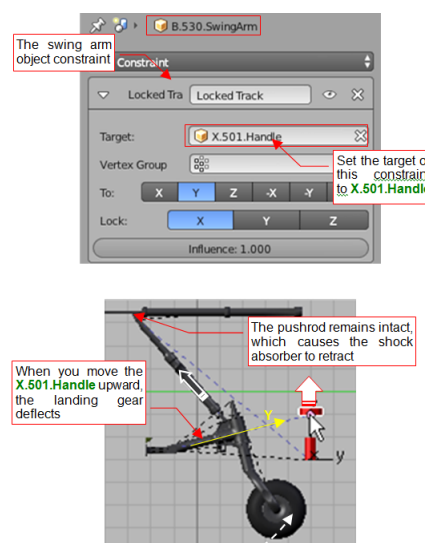


FIGURE 13 CLOSING THE TAIL WHEEL DOORS

Use **Transformation** constraints to convert the handle position into rotation of these door hinges

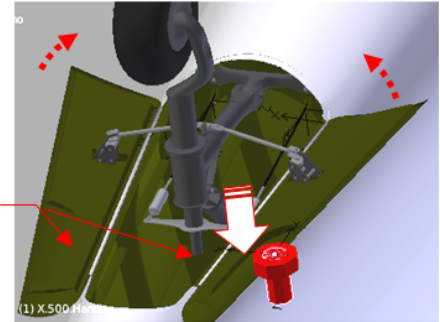


FIGURE 14 DETAILS OF THE DOOR RETRACTION MECHANISM

two drag braces. The end of each brace is connected to the barrel on the door fitting. I used Locked To constraints to control the pivot and barrels directions.

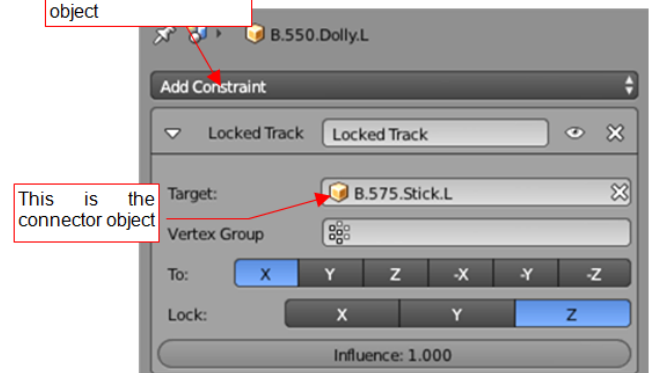
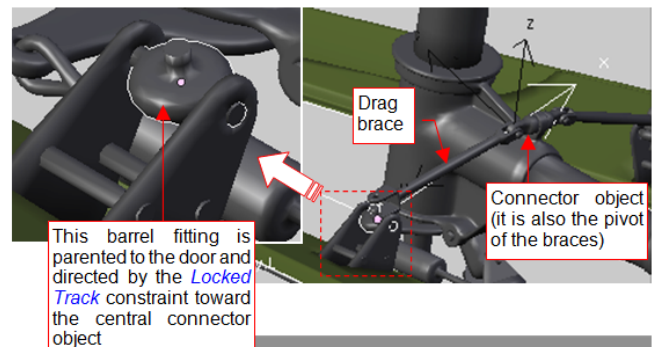


FIGURE 15 USING THE STRETCH TO CONSTRAINT

The braces have to use the Stretch To constraints, because of linear rotation of the doors (Figure 15):

Figure 16 shows the ultimate result: retraction of the complete tail wheel assembly. I drew on it the



Retracting Landing Gears

handles, because they are not rendered:

You can use similar solution for the main wheel. In the case of the P-40 it was simultaneously rotating around two axes (Figure 17):

I applied appropriate Transformation constraints to rotate the leg and its pivot (the latter part is hidden inside the leg and its fittings – see Figure 17).

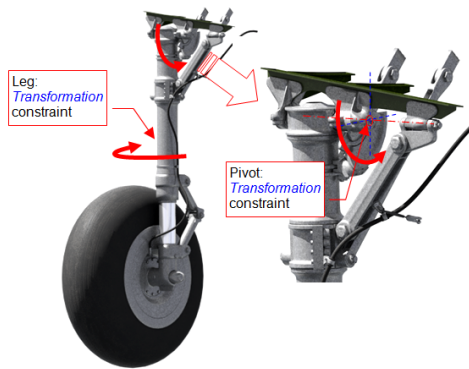
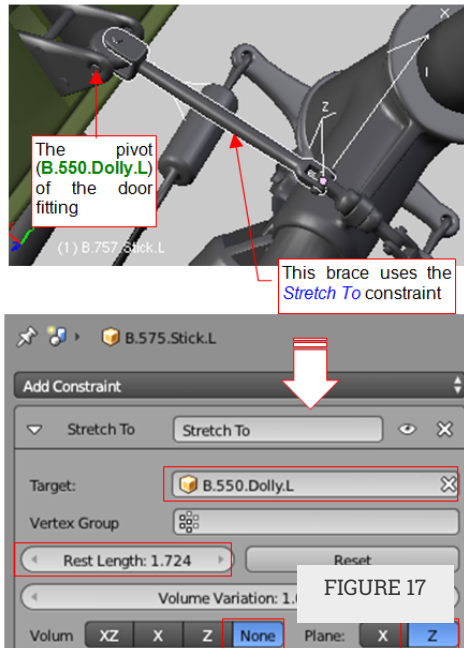


FIGURE 17 MAIN WHEEL CONSTRAINTS

Another interesting part of this mechanism is the scissor link (Figure 18). Its movement is caused by the shock absorber deflection. The easiest way to animate such pivoted struts is the armature.

However, to take advantage of the “one handle” system, I decided to obtain the same effect using constraints (Figure 18):

The key element of this scissor link assembly is the

central bolt. Its position is determined by two Limit Distance constraints, which keep it on fixed distance from the upper and lower bolts. The two struts have their origins at the

corresponding bolts (the upper or lower one). They are stretched toward the central bolt using the Stretch To constraints. I used this constraint here instead of the Locked Track, to hide minor gaps between their ends and the bolt (I cannot explain why they occur).

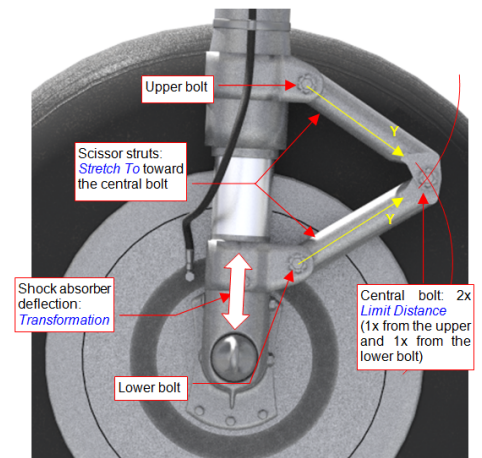


FIGURE 18 SCISSOR LINK CONSTRAINTS

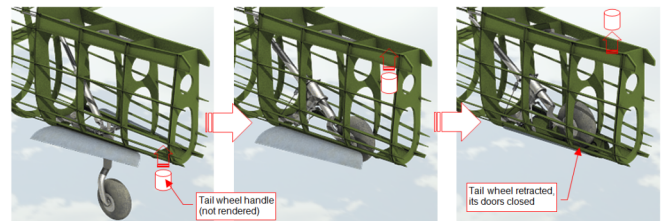


FIGURE 19 SHOWS THE RETRACTION OF THE COMPLETE MAIN WHEEL.

The model presented in this article is available at http://airplanes3d.net/model-p40_e.xml

The Handle Panel add-on and its description is available at http://airplanes3d.net/tutorials-020_p.xml

Except the undercarriage, there are also other movable parts which are worth to “mechanize”: the rudder, elevator, ailerons, wing flaps, etc. For each of



Retracting Landing Gears

these I created a handle. Finally, I ended up with dozens of different handles, “orbiting” around the model (Figure 20).

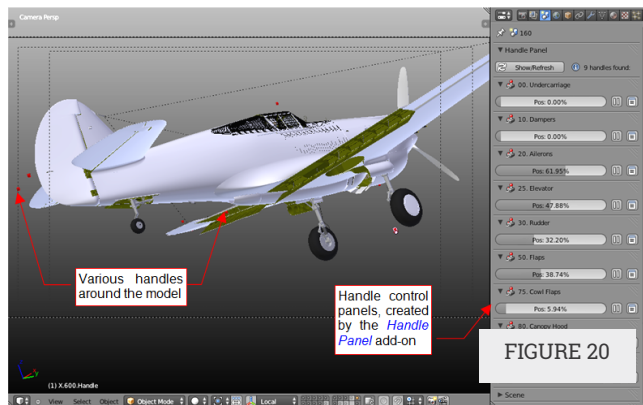


FIGURE 20

To manage them, I created an universal add-on. It scans the current scene for handle objects and creates their panels in the Properties window.

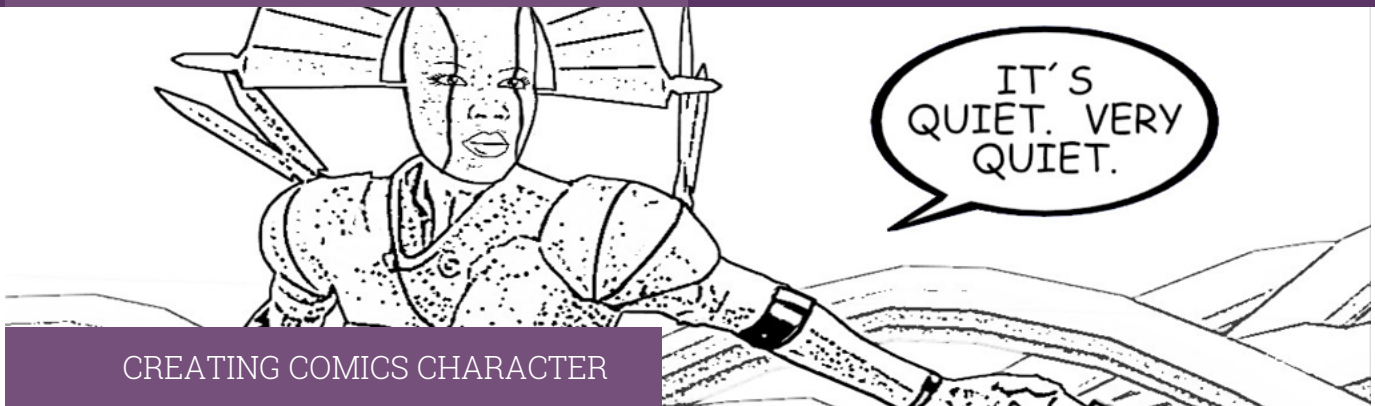


FIGURE 21

To do this “magic”, just append to the names of your handles the “.Handle” suffix, and assign to them Limit Location constraints. Using this tool, I can quickly pose the airplanes in such a scene like the one shown in Figure 21. ●

MAKING OF

Exploring blenderart and blenderheads



Acasio Osman

Contributing Author

The present article seeks to give a sample of the basic conceptual design for the creation of a character for a comic. As a comic maker, dedicated to count histories through the literature of the image we need to show the character's story through images, Blender is an ideal tool to make a comic.

THE CONCEPTUAL ART

For the hero or the villain's concept of comic, the first thing to on work is the history behind the character. To give answers to basic questions like: what should the hero/villain look like? What does he do? Where does he live? Those answers will be a great help when designing the character.

To know the character's history is highly important, and as the comics maker we base the character's conception on the script of the comic.

The comic script helps to maintain consistent details with the plot of the comic. For example, the environment where the character is revealed would define his personality and image certainly. The history behind the character would be reflected in basic elements such as it's expressions, gestures, and details like clothes, tattoos, gear and accessories.

PRE-PRODUCTION : THE HISTORY BEHIND THE CHARACTER

The comic in which I am working, is a comic of the gender SteamPunk where the main character is a robot monster hunter. A comic set in the Venezuela of Julio Verne of their novel "The superb Orinoco" (Le superbe Orenoque). An alternative Venezuela in 1893 where the typical characters of the industrialized society cohabitate with anachronic elements worthy of any science fiction history. A place where anything can happen and where the black magic and the technology meet each other and they are supplemented one with the other.

ONE MACHINE THAT LOOKS SEXY

The main character of my comic is a female robot possessed by the human soul of the monster hunter. Being a robot, I desire to give her a sexy look. A machine or robot can be as sexy as any human. The trick resides in seeing the heroine like a human being and less like a machine.

This is the most difficult part, because we all tend to see robots as machines, but giving them soul and human shape is the key to making them attractive.





Creating Comics Character

To make it more attractive we pay good attention to their hips and chest. If we play with the correct proportions, the character will reach the wanted sexy look. The character's face plays an important role that also deserves attention. A beautiful face on a robot will make it look more attractive. Working these areas of the body, we will be able to determine the sexy side of the robot.

INSPIRATION

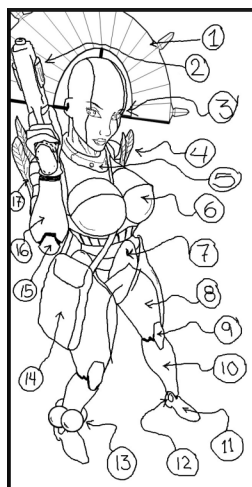


For the character's design of my comic, let us be inspired by the android Maria of the Fritz Lang's Classic masterpiece "Metropolis" (1927) and the android Eve of the videogame fighters "Dark Rift" (1996) of Kronos Digital Entertainment, Inc. Like characteristic African features, my character will have certain resemblance with a certain pop singer.

DISSECTING A COMIC CHARACTER CONCEPT

To really get familiar with a comic character, you need to break down the concept and identify each element. Study the concept and count every single piece that defines the comic character. Create a list of elements that compose the character.

Although it takes time, the list will give you an idea of the number of objects to model in 3D. You should also have a checklist to mark



things off as you build them.

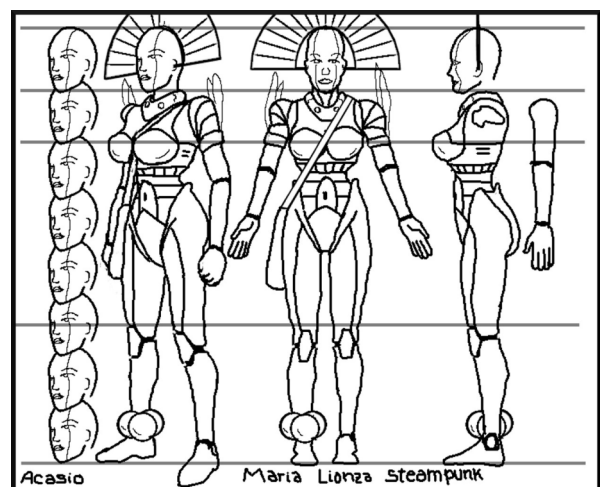
Another benefit of creating an element list is that it allows you to start thinking of how to approach the 3D modeling of each element. In the following case, the female robot consists of 17 parts that should be modeled in 3D. From parts of the body to accessories such as the crown (1), the gun(2), the maracas in the ankle (13) and the feathers (4).

As a general rule, it is better to model every single piece, including elements as simple as rivets for example. This way, one has absolute control of each element that composes our character and we can modify as we desire.

To model a 3D character for a comic in white and black, the selection of textures for our character's element won't be necessary, saving valuable time for the culmination of the comic project.

ANATOMICAL PROPORTION

When one draws a comic character, the head serves as a basic unit of measure. The standard rule dictates that an average person has six and one half heads of height. The proportions of the comic heroes are always extremely exaggerated. Often they are drawn with a height of eight heads. These proportions make





Creating Comics Character

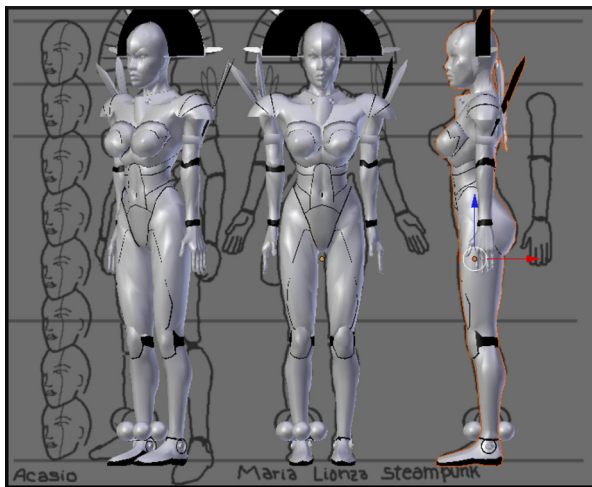
the figure seem enormous and unreal; qualities that are desirable for a comic hero.

Having this in mind, I create a model sheet of the character we will use as a reference for modeling 3D.



MODELING THE FACE

Starting from pictures taken from the internet of the face (Side and front) of a well-known singer of pop, the comic character's face is modeled in 3D using the polygon - to - polygon technique.



MODELING OF THE BODY

A female body base created in MakeHuman is exported to Blender for modification. Break down the mesh in all the pieces that compose part of the list you made in the beginning. Each element is modified

taking reference from the character sheet model.

MODELING OF THE WEAPON.

The heroine's weapon is created using the Box modeling technique. The accessories of the weapon are created from basic primitives. Again the use of pictures taken from the internet for reference will be of great help for such a purpose.

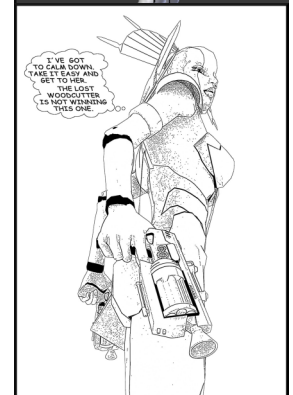
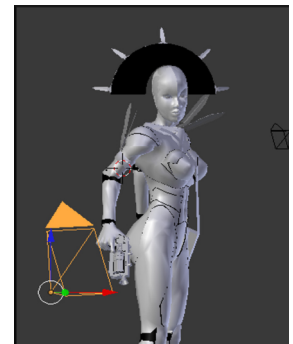


SETTING IN SCENE

The created character is put in a scene together with the other characters. Illumination is added to the scene and the camera will be adapted to the appropriate alignment to the frame format of the comic.

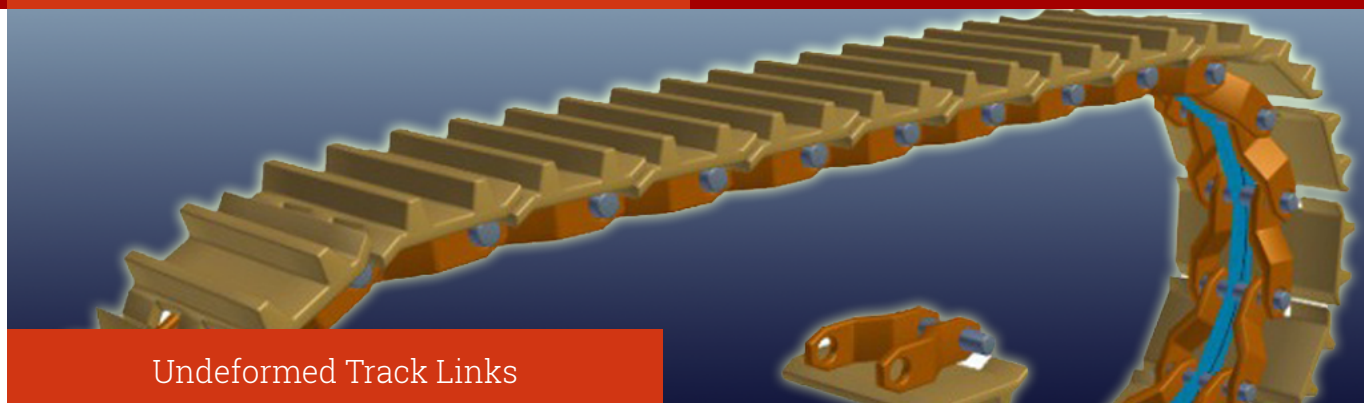
RENDERING

The frame is rendered with the Cartoon option and ambient occlusion. The Image is treated with filters in GIMP to give it the look of an inked comic. The speech bubbles and text of the comic are created in Blender. The comic edition carries out it in GIMP . The final result is a fanzine about the adventures a female robot Monster hunter in untameable lands ●



BLENDING

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Undeformed Track Links

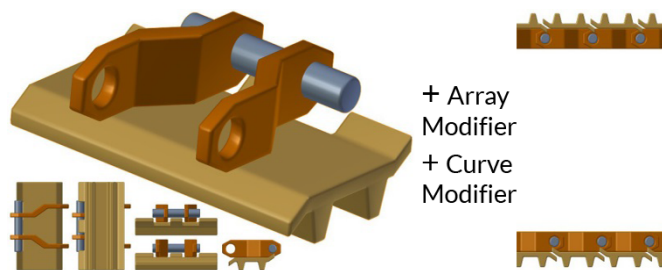
Alain Mathez (mcBlyver)

Contributing Author

You want to make a tank track, or something similar ? You watch some tutorials, and finally you use a Mesh Link, with an Array Modifier, and a Curve Modifier. This is easy to do, this is animatable, you are happy, so where is the problem ?

The problem is that the Curve Modifier is deforming your Mesh Link in the curved part or the Curve object. In addition, if you animate this system in the 3D viewport, it could be slow, very slow.

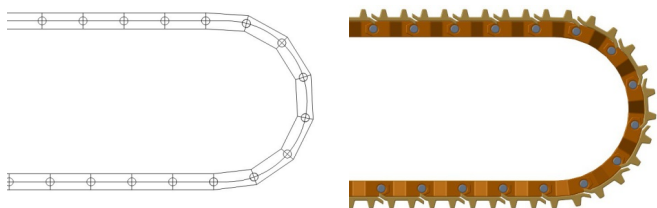
The workaround that I just discovered last week-end solves both problems.



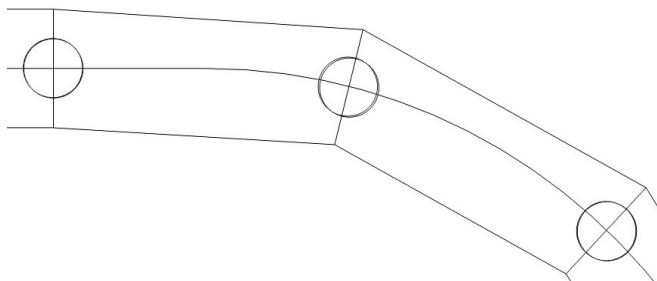
+ Array
Modifier
+ Curve
Modifier

- 1) The Mesh stays undeformed in the curved part
- 2) The animation is much faster in the 3D viewport
- 3) In bonus, it is not really harder to do than the first method.

The Mesh that has to receive the Array and the Curve Modifier is a simple Plane. This Plane has to be the Parent of the detailed Mesh Link, and must be switched on Faces option in the Duplication section.



Well, this method is not perfect. If you zoom on the curved part, you will see that the axis are not perfectly aligned with each other. But in most cases this won't be visible, and it will surely achieve a more realistic result than the first method.





Undeformed Track Links

My computer is a Win7, 64Bits, i7-3770K 3.90GHz, with 16GB RAM.

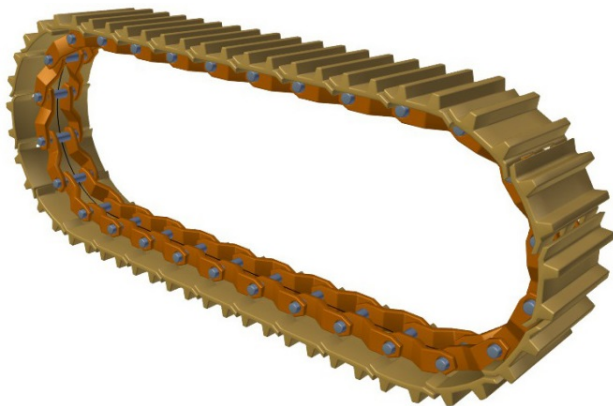
Because the detailed Mesh has first a Bevel and a Edge Split Modifiers, the animation of the first method runs in the 3D viewport at 2-3fps and has to work with 71600 vertices.

If I disable the Bevel and the Edge Split Modifiers, the animation runs at 15fps.

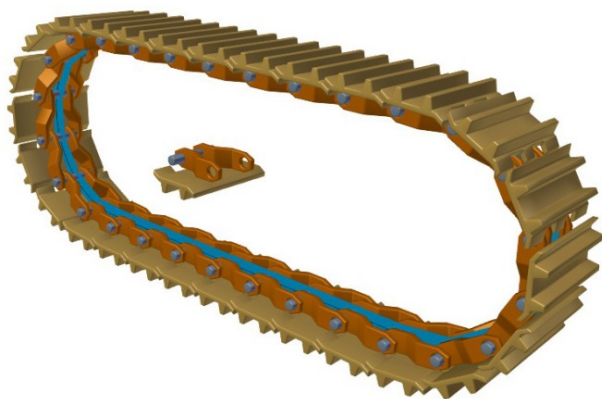
v2.69 | Verts:71600 | Faces:70672 | Tris:136864 | Objects:1/2 | Lamps:0/0 | Mem:45.11M (15.50M) | MaillonDirect

With the second method, the animation runs at 25fps, and only 2808 vertices are used for the exact same track.

v2.69 | Verts:2808 | Faces:2552 | Tris:4944 | Objects:1/3 | Lamps:0/0 | Mem:47.07M (15.50M) | Parent_MultiFace



Deformed method



Undeformed method ●

BLENDING

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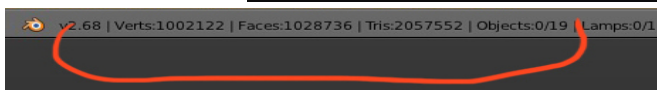
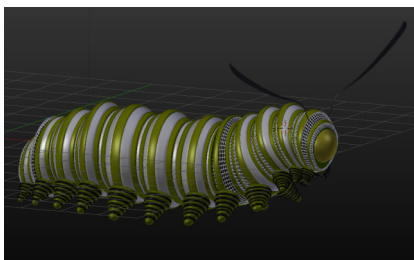
Lightening quick tips for modeling using Num-Pad keys

Krzysztof Bozalek

Contributing Author

Since this issue I will be part of the Blenderart team, on the Quick tip column. So let's try a coup with this challenge. This time I have chosen small but useful tips about modelling.

When your model is very complex, like this example. Navigation can be difficult and annoying. Depending on



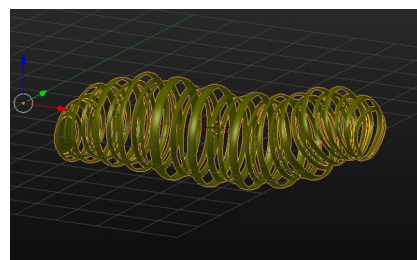
your PC, how many vertices you can use before your machine slows down,

But there is one quick way to get around this problem and speed up your work.

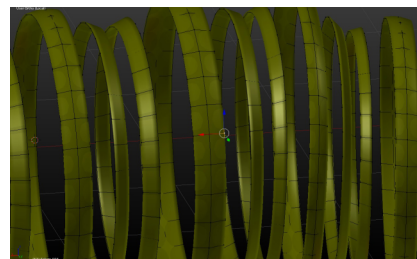
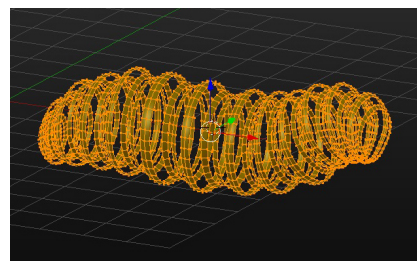
Tip1:Quick Hide: On standard desktop keyboards with **Num-pad** there is "/" (slash) key. If you select one separate object of your model and then press "/" on the num-pad, unselected objects will disappear and you can easily continue working. (Same as **Shift+H** only quicker).

B

e warned, there is no notification about this function. If you save the file with this function on, you will not be able to find your work. (pressing "/" key on numpad again or **Alt-H** reveals the hidden objects back as usual).



Tip2: Zoom fast: The other button is also on the num-pad, and it is "." (DOT). It can be very useful in edit mode specially if you want to focus on one part of your model, tap it and you can just zoom in with your mouse wheels.



Here is a double whammy, the zoomed selection will now also act as the rotation point regardless of your usual rotation preference. I hope these quick tips have made your modeling session quicker and useful ●

GALLERIA

Blender artworks from the blenderheads



Kaid - by Connor Simpson

GALLERIA

Blender artworks from the blenderheads



Ramses Walker -by Angel Roldan

GALLERIA

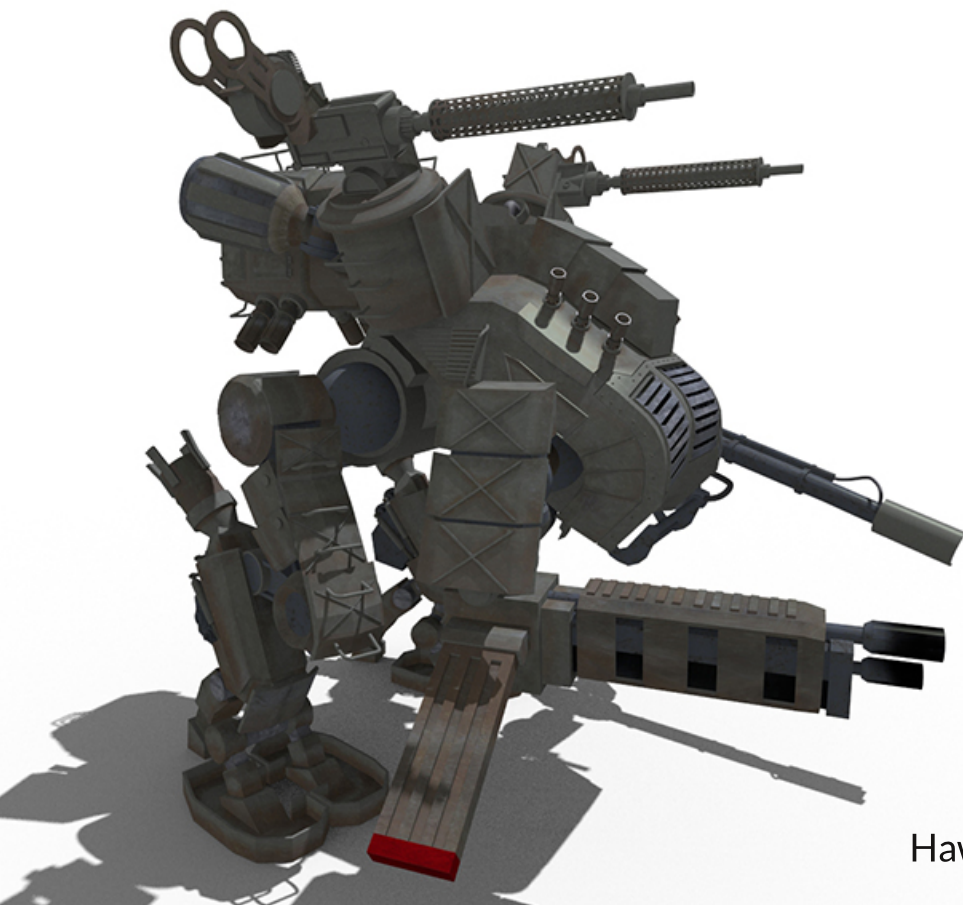
Blender artworks from the blenderheads



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GALLERIA

Blender artworks from the blenderheads



HAWKEN DENIER



Hawken_DENIER by Angel Roldan

GALLERIA

Blender artworks from the blenderheads



P-40 -by Witold Jaworski

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P-40 -by Witold Jaworski

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M4W1_FloorModel -by Angel Roldan